

Drowsy Driver Detection Research

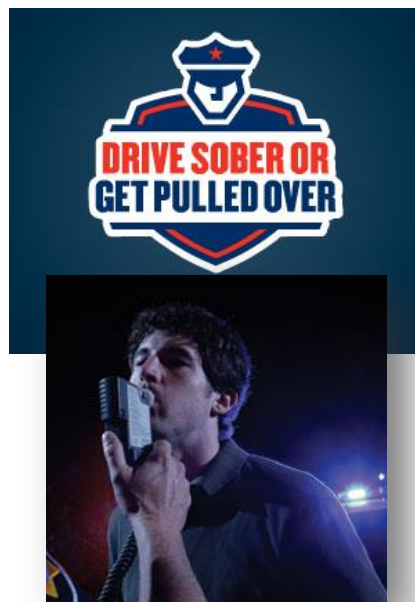
Chris Monk
Human Factors/Engineering Integration
Vehicle Safety Research

NHTSA's Driver Impairment Research and Programs

Distraction



Alcohol



Drowsiness



dadss
Driver Alcohol Detection
System for Safety

Drowsy Driver Data

■ FARS data (all vehicles):

- 2.4% of fatal crashes between 2008 and 2012 reported as involving a drowsy driver
- In 2012, there were 829 fatalities that were reported to involve drowsy driving
 - Most recent data available

In-Vehicle Drowsiness Detection

- **Accurately detecting states of drowsiness and fatigue in real-time is challenging**
 - Physiological data approach
 - Brain activity (EEG), heart rate
 - Camera/sensor data approach
 - Eyelid closure analysis, yawning
 - NHTSA conducted research using eyelid detection (i.e., PERCLOS) in Heavy Trucks (2009; DOT HS 811-117)
 - Vehicle-based driver behavior data approach
 - Steering inputs, lane-keeping
 - Current NHTSA research

NHTSA's Research on Detection

- NHTSA research is investigating the use of vehicle-based data to predict three types of impairment:
 - Alcohol
 - Drowsiness
 - Distraction
- Goal is to evaluate the potential to accurately detect these impairment states without additional detection sensors/technologies

NHTSA Research on Detection

- Advanced Countermeasures for Multiple Impairment
 - Overnight drives in the National Advanced Driving Simulator after being up all day
 - Real-time algorithms, based on lane-keeping and steering behavior, successfully detected drowsiness six seconds before lane departures
 - Published in 2014: DOT HS 811 886



Detection Technology Potential

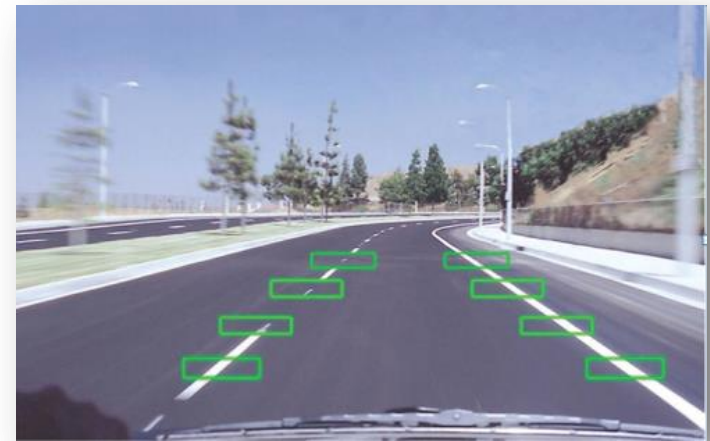
- NHTSA's research demonstrates the potential for using vehicle-based data to detect drowsiness
 - Distraction and Alcohol impairment states also can be detected
- Efficacy and practicality of other detection technology approaches are still unclear
 - Eyelid closure measures
 - Facial expression tracking
 - Physiological measures

Countermeasures: In-Vehicle Feedback

- Feedback to drivers once drowsiness state detected?
 - What kinds of feedback results in behavior change?
- Current NHTSA Research
 - Assess potential countermeasure for drowsy driving lane departures
 - Evaluate an initial proof of concept for the use of this system in the development of safety technologies such as driver feedback displays for drowsiness

Crash Avoidance Technologies

- Crash warnings are designed to draw the driver's attention to the situation
- They have the potential to help in variety of situations, including for impaired drivers, be it distracted, drowsy, or otherwise inattentive
- NHTSA has included Crash Warning systems into its New Car Assessment Program
 - NHTSA's 5-Star Safety Ratings
- ANPRM published Aug. 18, 2014 for V2V, which would enable many more crash avoidance applications
- Agency decision on automatic emergency braking (AEB) in the coming months



Thank You For Your Attention